

**TAXONOMIC STUDY OF THE NEARCTIC SPECIES OF
ELACHERTUS SPINOLA (HYMENOPTERA: EULOPHIDAE)**

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Abstract.—The nearctic species of *Elachertus* (Hymenoptera: Eulophidae) are revised and an illustrated key is presented. A review of the known hosts and distributions of the species is also given along with a diagnosis and notes on types. Lectotypes are designated for *proteoteratis* Howard, *cacoeciae* Howard, *glacialis* Ashmead, *hyphantriae* Crawford, *marylandicus* Girault, *cidariae* Ashmead, and *louisiana* Girault. The following new synonymies are proposed: *coxalis* (Howard, 1885); *proteoteratis* (Howard, 1885); and *pini* Gahan, 1927 = *argissa* (Walker, 1839); *glacialis* (Ashmead, 1902) and *aeneoniger* (Girault, 1917) = *cacoeciae* (Howard, 1885); *hyphantriae* Crawford, 1911 and *marylandicus* (Girault, 1916) = *cidariae* (Ashmead, 1898). Two new taxa (*loh* and *atus*) are described and illustrated. All the species are primary parasites of the larvae of Lepidoptera including the pine tip moth (*Rhyacionia frustrana*), redbanded leafroller (*Argyrotaenia velutinana*), and spruce budworm (*Choristoneura fumiferana*).

Species of *Elachertus* are primary parasites of a variety of lepidopterous larvae. Some species are polyphagous, parasitizing hosts belonging to several different families. The larvae of these wasps are often gregarious and their pupae are frequently seen clustered on the surface of leaves or on the body of their host. They seem to prefer host larvae that occupy sheltered situations such as leafrolls or that bore inside twigs or growing tips. Several of these host species are of economic importance, being pests of various forest trees and ornamental plants. Nevertheless, the North American species of *Elachertus* have never been revised and no keys are available to aid in their identification. In addition, since the publication of the North American Hymenoptera catalog (Burks, 1979) several new host and locality records for a number of the species have been established and undescribed species have been reared. Finally, it has become apparent that taxonomic problems exist in this genus, e.g. undetected synonymy of some of the species and types not selected. This paper is an effort to address these problems and needs.

All types (except *atus* n. sp.) are deposited in the U.S. National Museum of Natural History. Names of hosts follow Hodges et al. (1983) and common names of hosts are from Werner (1982). Terminology for morphological structures follows Graham (1959) and for sculpturing Harris (1979). New host and locality records established during the course of this study are marked by an asterisk. Measurements and ratios were made with an eyepiece reticle. Widths and lengths

of antennal segments, metasoma, and so on were measured at the widest or longest point.

Acronyms for museums are as follows: Biosystematics Research Institute, Ottawa, Ontario, Canada (CNC); Illinois Natural History Survey, Champaign, Illinois (INHS); British Museum, London (BM); Museum of Zoology and Entomology, Lund University, Lund, Sweden (SWE); Oregon State University, Corvallis, Oregon (OSU).

Elachertus Spinola

Elachertus Spinola, 1811: 151.

Type-species.—*Diplolepis lateralis* Spinola. Desig. by Gahan and Fagan, 1923.

Microterus Spinola, 1811: 151.

Type-species.—*Diplolepis petiolata* Spinola. Desig. by Gahan and Fagan, 1923.

Elachestus Nees, 1834: 135. Emend.

Elachistus Foerster, 1856: 73. Emend.

Epardalus Girault, 1917: 5.

Type-species.—*Elachistus cidariae* Ashmead. Orig. Desig.

Peteenus Erdos, 1961: 471.

Type-species.—*Peteenus pulcher* Erdos. Orig. Desig.

Diagnosis.—This genus can be differentiated from other genera of Eulophidae by the following combination of characters: antennal funicle with four articles (Figs. 16, 17); toruli at or above ventral margin of eye; notauli complete (Fig. 2); scutellum with lateral grooves, curving inwards posteriorly, delimiting a narrow band of scutellum at the posterior margin (Fig. 2), with two pairs of setae; midlobe of mesoscutum with 3 or more pairs of setae; postmarginal vein longer than stigmal. Males with sensory pores of scape limited to upper third, separated by less than their own diameter (Fig. 18).

Discussion.—Species of *Elachertus* are most similar to the genus *Hyssopus* Girault. Females can be differentiated by the following: 3 or more pairs of setae on the midlobe of the mesoscutum (2 pairs only in *Hyssopus*); toruli inserted at or above ventral margin of eye (below ventral margin in *Hyssopus*). Males can also be separated by the pattern of pores on the scape (Fig. 18 versus 19), although this requires clearing and mounting of the antennae.

Other related genera (e.g. *Miotropis* and *Stenomiesius*) either do not have scutellar grooves or the grooves, when present, do not extend the full length of the scutellum and do not meet medially and set off a narrow band of scutellum at the posterior margin. In addition, related genera often have the median propodeal carina split into two parallel carinae for most of its length or otherwise elaborated as in *Stenomiesius* (median carina single and complete in *Elachertus* and only rarely with a small dorsal v-shaped opening); the head and thorax are often extensively marked with yellow as in some species of *Miotropis*, *Stenomiesius*, and *Cirrospiloideus* (head and thorax generally wholly black or dark metallic in *Elachertus*); and the occiput may possess a distinct semicircular carina as in *Ardalus* and at least some *Stenomiesius* (no occipital carina in *Elachertus*).

This genus is one of a complex of closely related taxa which have been placed by various authors either in the subfamily Elachertinae (e.g. Askew, 1968; Peck,

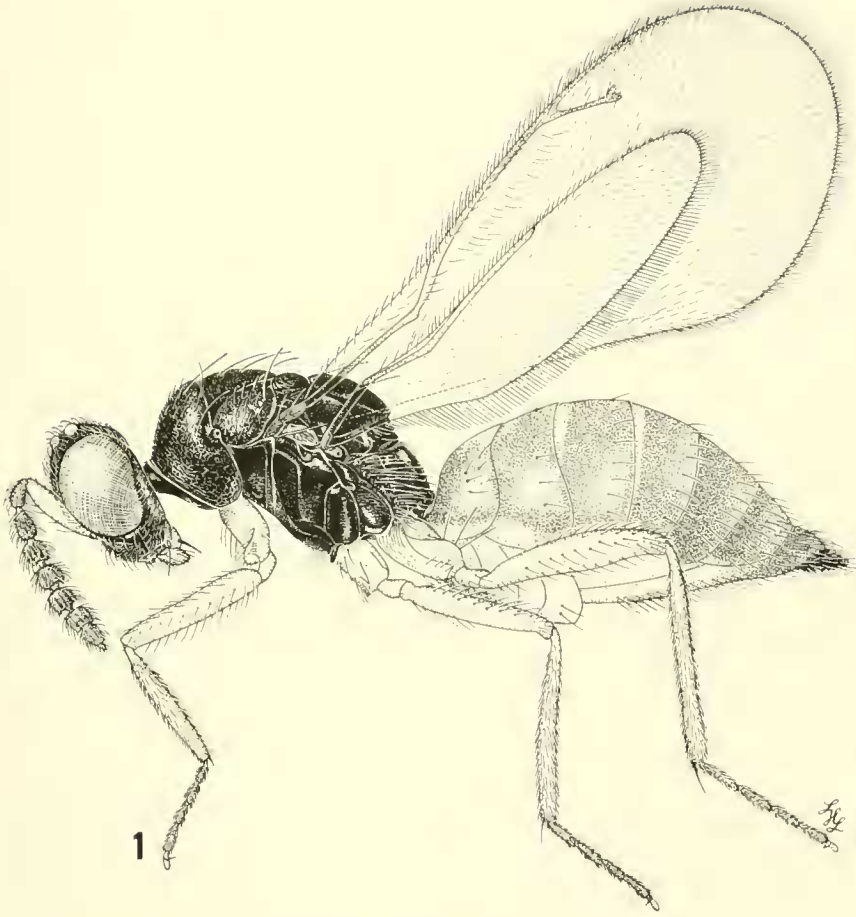


Fig. 1. Habitus of *Elachertus loh* Schauff, new species.

1963) or in the tribe Elachertini (e.g. Burks, 1979). The monophyly of these groups has not been established and I am reluctant to follow any tribal or subfamily classification until such time as a comprehensive analysis of the genera of this group can be carried out. The monophyly of *Elachertus* itself has been questioned and various groups of species have been assigned and later removed from it (e.g. the species included in *Hyssopus* Girault). I have found that most of the characters that have been used to set apart these species either vary among the taxa or can not be interpreted as being uniquely shared among the species. For example, the longitudinal grooves of the scutellum occur in a number of different genera and are expressed in a variety of ways. In species of *Hyssopus*, they are identical to *Elachertus* (grooves curving inward posteriorly and meeting, leaving a narrow band of scutellum at the posterior and lateral margins). The same is true of the number of antennal segments, denticles of the mandibles, wing venation, and so on. The male genitalia also provide no unique structural differences for *Elachertus*. The same basic male genitalie structure is present in males of *Hyssopus*, *Miotropis*, *Ardalus*, *Cirrospiloideus*, and others. Since no comprehensive revision of most of

these genera has been undertaken, the limits and monophyly of most of these related groups also remains in doubt. However, another character unique to males does indicate that the species of *Elachertus* are a monophyletic group. The inner lateral surface of the scape of males of *Elachertus* and related genera possess an array of small sensory pores. In all of the species of *Elachertus* in which I have been able to examine the male antennae, the area of the pores is restricted to the distal one third of the scape and the pores form a small tight group (Figs. 18, 19) in which the individual pores are contiguous or separated by less than their own diameter. I believe this state to be synapomorphic for *Elachertus*. In some species, this area is clearly marked and can be seen in point mounted specimens, although the pores themselves cannot generally be seen with a dissecting microscope. In others, this area can only be discerned in cleared and slidemounted antennae. In *Hyssopus* (Fig. 20) these pores are scattered over nearly the entire surface of the scape and are set off from one another by one or two diameters. In other genera, the size of the area may be reduced, but again, the pores are seldom in contact with one another and the lower pores usually reach at least half way down the scape.

Many of the North American species placed in *Elachertus* were described one or two at a time by various authors from single specimens or short series. Most of the differences between these species cited by the original authors were small differences in coloration. After studying larger series and specimens from wider geographic areas, I attribute most of these color differences to intraspecific variation.

KEY TO THE NEARCTIC SPECIES OF *ELACHERTUS*

This key includes males and females. The species *multidentatus* (Girault) is known only from the holotype which is missing several critical parts and I have not included it in the key. It can be identified by the following characters: axillae ending on line with anterior margin of scutellum as in Fig. 2; mandibles with row of about 9 minute teeth along the upper edge (Fig. 21); mesoscutum rugose; scutellum coriaceous; dorsellum a transverse narrow band, propodeum laterad of carina sunken and minutely sculptured (similar to Fig. 13); all funicular articles longer than wide.

- 1). Anterior margin of scutellum and axillae forming a straight line (Fig. 2); petiole at least as long as wide; dorsellum with lateral lobes, excavated ventrally (Fig. 3) 2
 - Axillae protruding cephalad of the anterior margin of the scutellum (Figs. 4, 6, 12); petiole reduced to a narrow transverse band; dorsellum without lateral lobes, not excavated ventrally (Figs. 5, 7, 13) 3
- 2). Malar suture in females straight (Fig. 14); POL 2× OOL; male head with vertex and occiput lightly sculptured as in Fig. 8; male antennae densely setose (Fig. 16) *argissa* (Walker)
 - Malar suture in females curved (Fig. 15); POL 1.5× OOL; male head rugose except for scrobes (Fig. 11); male antennae with only a few sparse setae (Fig. 17) *atus* Schauff n.sp.
- 3). Scutellum smooth (Fig. 4); mandibles with 2 large and 3–4 smaller teeth (Fig. 8) 4

- Scutellum alutaceous or coriaceous (Fig. 6); mandible blunted, without obvious teeth (Fig. 10) 5
- 4). Face below toruli evenly rugose (Fig. 9); midlobe of mesoscutum with 3 pairs of setae; male antennae with sparse white hairs, pores on scape as in Fig. 19 *loh* Schauff n.sp.
- Face below toruli lightly sculptured medially, smooth laterally (Fig. 8); midlobe of mesoscutum with more than 3 pairs of setae; male antennae with numerous white hairs, pores on scape as in Fig. 18 *cacoeciae* (Howard)
- 5). Propodeum laterad of carina sunken and with some sculpture (Fig. 13); cubital and basal vein absent, submarginal with 3 or 4 setae (Fig. 22) *louisiana* (Girault)
- Propodeum laterad of carina not sunken, smooth (Fig. 7) forewing with cubital and basal vein present, submarginal vein with 7 setae (Fig. 23) *cidariae* (Ashmead)

Elachertus argissa (Walker)

Eulophus argissa Walker, 1839: 172.

Eulophus saon Walker, 1839: 175. Synonymy by Bouček and Askew, 1968.

Eulophus eurybates Walker, 1839: 178. Synonymy by Bouček and Askew, 1968.

Elachistus opaculus Thomson, 1878: 193. Synonymy by Bouček and Askew, 1968.

Elachistus proteoteratis Howard, 1885: 27. NEW SYNONYMY.

Elachistus coxalis Howard, 1885: 28. NEW SYNONYMY.

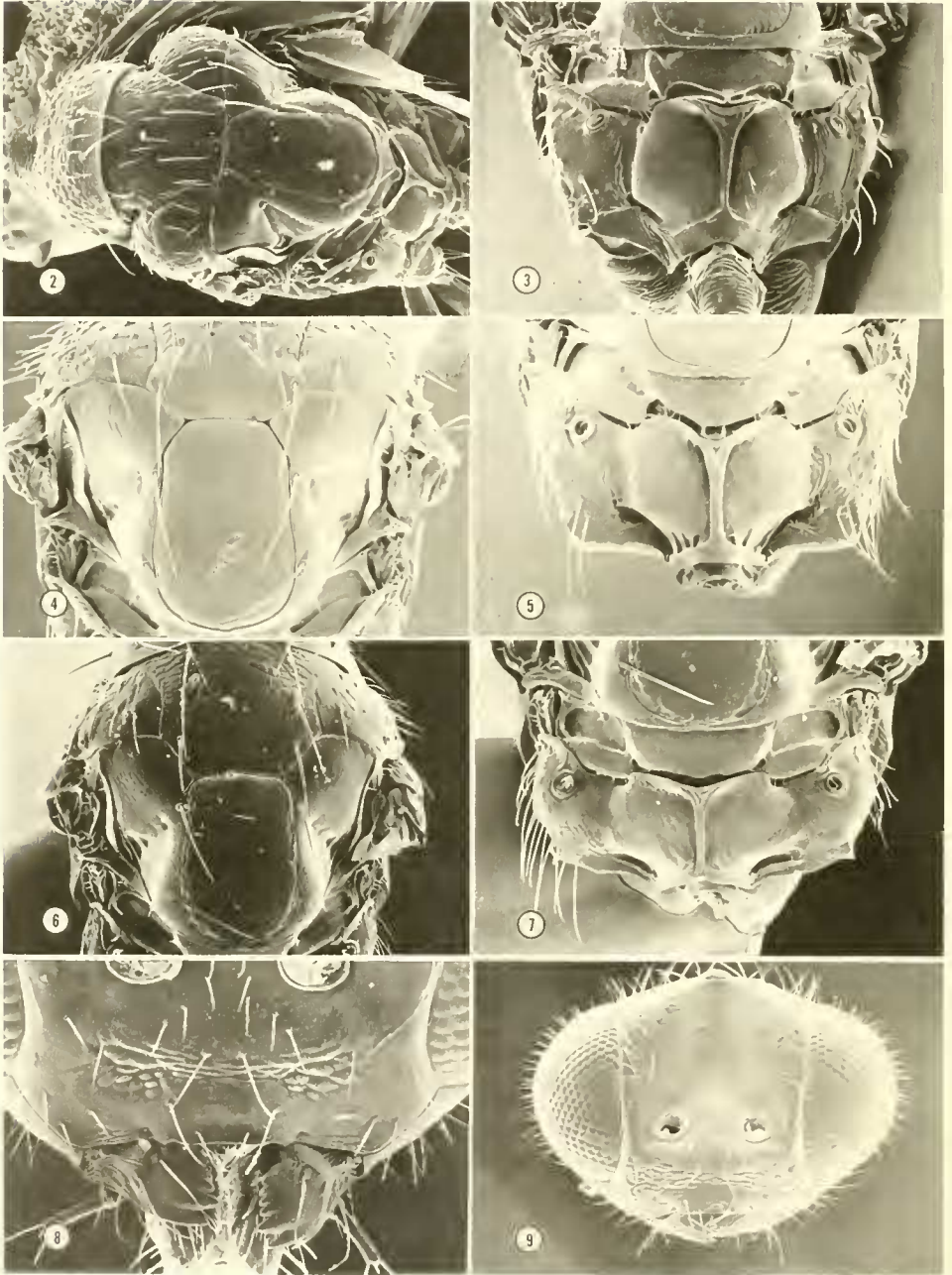
Elachertus pini Gahan, 1927: 547. NEW SYNONYMY.

Diagnosis.—Anterior margin of axillae on a straight line with the anterior edge of the scutellum (Fig. 2); midlobe of mesoscutum with more than 3 pairs of setae; scutellum coriaceous; malar suture straight (Fig. 14); dorsellum generally smooth; males with eye height 1/2 to 2/3 of head height; face smooth, occiput and genae alutaceous or coriaceous.

This species is most closely related to *atus* n.sp., which shares the distinct petiole and straight anterior border of the scutellum and axillae. Females can be separated by the straight malar suture (Fig. 14), which is curved in *atus* (Fig. 15); the dorsellum which is generally smooth as in Fig. 3 (generally sculptured in *atus*); and the posterior ocellar length 2 × the ocell-ocular length (1.5 × in *atus*). Males have the head (except the scrobes) alutaceous or coriaceous, whereas males of *atus* have the head (except for the scrobes) uniformly rugose (Fig. 11).

Types.—According to the original description, *proteoteratis* was described from a series of 3 females (USNM type no. 2658). However, the point on which the specimens were mounted shows evidence of having held 4 specimens. Only 2 specimens remain, the others being indicated only by pieces of wings and legs. The lectotype (present designation) is indicated by a black arrow. The head and antennae are slidemounted. Both point and slide bear the data: Missouri, Kirkwood. June, 1873. ex. larvae of *Proteoteras aesculana* Riley. C.V.R. coll.

The holotype of *coxalis* (USNM type no. 2660) is point mounted with the data: "on window, D.C., June 14, 1881." In his description Howard added that the specimen was collected by C. V. Riley. Howard mounted the antennae on a slide and subsequently Girault mounted the head (which he smashed), parts of the legs, and a forewing on a second slide.



Figs. 2-9. Scanning electron micrographs of *Elachertus*. 2, Thorax of *E. argissa*. 3, Propodeum of *E. argissa*. 4, Dorsal thorax of *E. cacoeciae*. 5, Propodeum of *E. cacoeciae*. 6, Dorsal thorax of *E. cidariae*. 7, Propodeum of *E. cidariae*. 8, Face and mandibles of *E. cacoeciae*. 9, Face of *E. loh*.

The holotype of *pini* Gahan is point mounted (USNM type no. 40180) with the data: Virginia, Falls church, July, 1924, ex. *Rhyacionia frustrana*. R. A. Cushman collector. There are 6 male and 4 female paratypes with the same data as the holotype.

I have not seen the Walker type of *E. argissa*. However, Dr. Z. Bouček has been kind enough to send me specimens from the British Museum that he has compared with the types.

Other specimens examined.—21 ♂ and ♀ (SWE), 16 ♂ and ♀ (OSU), 183 ♂ and ♀ (CNC), 9 ♀ (INHS), 185 ♂ and ♀ (USNM), 4 ♂ and ♀ (BM).

Variation.—Length varies from 1.1 to 2.3 mm. Color varies from flat black with little evidence of any metallic sheen to distinctly metallic green. The metasoma is rarely metallic and is usually lighter in color basally than apically, but in a few specimens the color is uniformly dark throughout. The coxae and legs may be almost entirely yellow in the metallic colored specimens, but in blacker specimens, the coxae become increasingly darker and the hindfemur is occasionally brown medially. In a few specimens, the legs are entirely light brown. The scape and mandibles vary from yellow to brown and the funicular articles from light brown to black. The sculpturing of the scutellum varies from lightly alutaceous to distinctly coriaceous. The dorsellum in a few specimens shows slight evidence of alutaceous sculpture. In one series the anterior end of the median propodeal carina forks, forming a small raised triangular opening.

Nearctic hosts.—Tortricidae: *Amorbia cuneana* (Wlms.)*; *Archips argyrospilus* (Wlk.) (fruittree leafroller)*; *Barbara colfaxiana* (Kearf.) (Douglas-fir cone moth)*; *Epinotia laracana* (Kft.); *Endopizia viteana* Clem. (grape berry moth)*; *Platynota stultana* Wlms.*; *P. idaeusalis* (Wlk.)*; *Proteoteras aesculana* Riley; *Sparganothis sulferana* (Clem.)*; *Spilonota ocellana* (D. & S.) (eyespotted bud moth)*. Gracilariidae: *Caloptilia packardella* (Cham.)*; *Parornix geminatella* (Pack.). Gelechiidae: *Pthorimaea operculella* (Zell.) (potato tuberworm)*. Pyralidae: *Omiodes indicata* (F.)*; *Dioryctria zimmermani* (Grote) (Zimmerman pine moth)*; *Acrobasis caryivorella* Rag.*. Oecophoridae: *Psilocorsis reflexella* Clem.*; *Stenoma algidella* (Walk.)*; *Depressaria* sp.*. Olethreutidae: *Rhyacionia frustrana* (Comst.) (pine tip moth); *Rhyacionia buoliana* (D. & S.) (European pine shoot moth)*. Coleophoridae: *Coleophora laricella* (Hbn.) (larch casebearer).

Palaearctic hosts.—Tortricidae: *Archips xylosteamus* L., *Epinotia fraternana* Haworth, *Exotelia dodecella* L., *Zeiraphera diniana* Guénée. Coleophoridae: *Coleophora limosipennella* Duponchel.

Distribution.—Holarctic. Occurs throughout United States and Canada. Also known from Mexico, South America, and most of Europe.

Notes.—Howard described *coxalis* on the page immediately following his description of *proteoteratis* and noted that the hindcoxae of *coxalis* possessed a slightly darker spot than those of *proteoteratis*. This color difference, and leg color in general, varies considerably and I can find no structural differences that might indicate that two species are present. Likewise, Gahan described *pini* based on a difference in body color (green in *proteoteratis* and black in *pini*), but my material makes it clear that this character also varies. Specimens of *argissa* from Austria and Northern Italy were imported on several occasions and released in North America against the imported European larch casebearer (Ryan et al., 1975, 1977).

These wasps were reared from the related host *Coleophora limosipennella*. It was unknown at that time that this same species already occurred in North America under the name of *proteoteratis*. At present, this is still the only species in the genus that is known to have a holarctic distribution.

This is the most common and widespread species of *Elachertus* in North America and it also has the broadest host range. It would appear that this species will attack almost any small lepidopterous larva in a suitable microhabitat and I would expect the host range to continue to broaden as additional rearings are made.

Elachertus cacoeeciae (Howard)

Elachistus cacoeeciae Howard, 1885: 28.

Elachistus glacialis Ashmead, 1902: 147. NEW SYNONYMY.

Elachistus aeneoniger Girault, 1917: 2. NEW SYNONYMY.

Diagnosis.—Axillae protruding cephalad of scutellum (Fig. 4); scutellum smooth; petiole reduced, not as long as wide; mandible with obvious teeth (Fig. 8); midlobe of mesoscutum with more than 3 pairs of setae; face below toruli with sculpture only medially.

This species is most similar to *loh* n.sp. which shares the protruding axillae and the distinctly toothed mandible. *E. cacoeeciae* can be identified by the setae of the midlobe of the mesoscutum (only 3 pairs in *loh*), and the sculpturing below the toruli (face evenly rugose in *loh*, Fig. 9). Males have the pores on the scape as in Fig. 18 (*loh* as in Fig. 19).

Types.—The original syntype series of *cacoeeciae* (USNM type no. 2659) was mounted on a single multipointed card. Three of the six specimens mentioned by Howard have been lost. The lectotype (present designation) is the middle of the three remaining specimens and is indicated by a black arrow. The one intact antenna and a forewing have been slidemounted. The point contains the data: "on rose, Kirkwood near Godfrey, Aug. 1877." Howard, in the original description added: "from the leaf curl of *Cacoeecia rosaceana* (Harr.), at Kirkwood, Mo. C. V. R. Coll."

The holotype female of *aeneoniger* Girault (USNM type no. 20024) is point mounted with the data: Ithaca, N.Y. 20 April, 1915. The head and forewing are slidemounted. Girault did not mention how many specimens he had of this species in his original description. There is only a single female labelled as type in the USNM and I hereby designate it lectotype.

The lectotype (present designation) female of *glacialis* is mounted on a minuten pin with the data: Muir inlet [Alaska], 6/12/1899. Harriman expedition, T. Kincaid collector. USNM type no. 5530. The paralectotype male was collected at Yakutat on June 21. Girault slidemounted the head, abdomen, forewings, and part of the legs of the female as well as the head and antennae of the male. The majority of these pieces are badly crushed or disarticulated.

Other specimens examined.—147 ♂ and ♀ (USNM), 158 ♂ and ♀ (CNC), 4 ♀ (INHS), 22 ♂ and ♀ (OSU), and 7 ♀ (SWE).

Variation.—Length varies from 1.1 to 2.7 mm. Color is generally black or reddish brown with the metasoma dark to light brown. The fore- and midcoxae may be entirely yellow to entirely dark brown or black. The rest of the legs vary from yellow to brown and in a few specimens are almost entirely black. The antennae range from brown to black, with the scape sometimes light brown or

yellowish at the base. The metasoma may have extensive yellowish areas anterodorsally and ventrally. The midlobe of the mesoscutum may have as few as 4–5 pairs of setae and as many as 20 pairs; the sculpture of the mesoscutum often fades to smooth as it approaches the anterior edge of the scutellum. The wing veins vary in color from yellow to dark brown.

Hosts.—Tortricidae: *Acleris variana* (Fern.) (eastern blackheaded budworm)*; *Ancylis comptana* (Frölich) (strawberry leafroller); *Archips argyrosphilus* (Walk.) (fruittree leafroller); *Argyrotaenia pinitubana* (Kearf.) (pine tube moth); *A. velutinana* (Walk.) (redbanded leafroller); *Argyresthia oreasella* Clem.; *Barbara colfaxiana* (Kearf.) (Douglas-fir cone moth); *Choristoneura fumiferana* (Clem.) (spruce budworm); *C. rosaceana* (Harr.) (oblique banded leafroller); *Cydia caryana* (Fitch)*; *Mellisopus latiferranus* (Wlms.) (Filbertworm). Notodontidae: *Heterocampa guttivitta* (Walk.) (saddled prominent); *Schizura unicornis* (Smith) (unicorn caterpillar). Arctiidae: *Hyphantria cunea* (Drury) (fall webworm).

Burks (1979) lists *Eulophus orgyiae* (Fitch) (Eulophidae) as a host of *cacoeciae*, but I consider this to be highly doubtful since *Elachertus* are not known to be hyperparasitic. In addition, there is a series of specimens in the USNM collection from California that is labelled as “ex. *Bruchus lobatus*.” However, considering the known reliable host associations of these species, I would regard this record as questionable.

Distribution.—Occurs throughout United States and Canada.

Notes.—*E. glacialis* Ashmead and *E. aeneoniger* Girault, synonymized above, were separated by those authors from *cacoeciae* on the basis of color differences. However, as in the case of *proteoteratis*, when a number of specimens from different localities and hosts are examined, it is apparent that intermediate forms are present.

Next to *argissa*, this is the most commonly collected species. Likewise, it is widespread and has a broad host range.

Elachertus cidariae (Ashmead)

Elachistus cidariae Ashmead, 1898: 157.

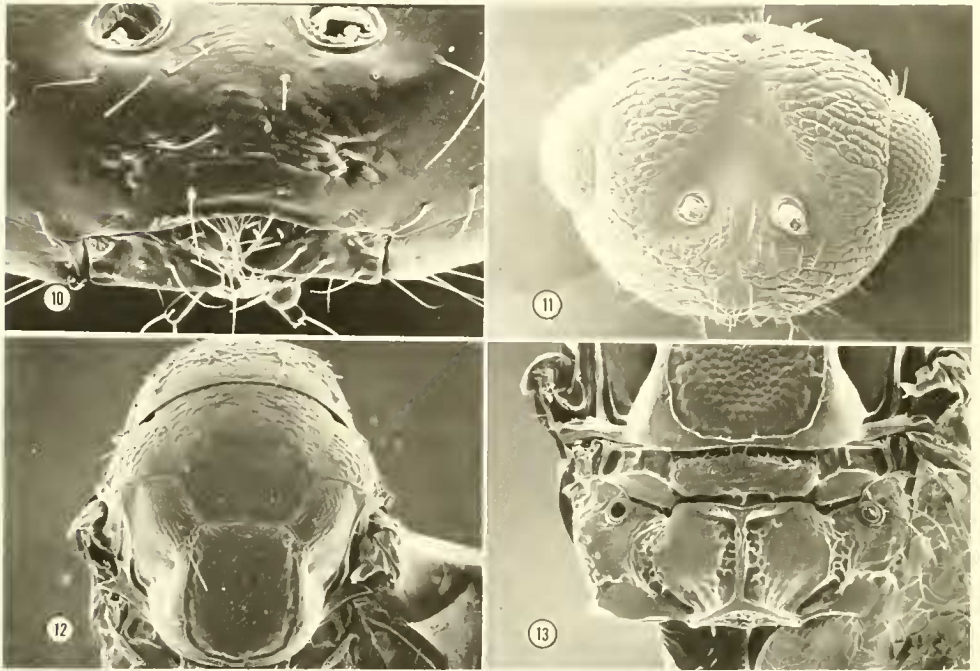
Elachertus hyphantriae Crawford, 1911: 622. NEW SYNONYMY.

Elachistus marylandicus Girault, 1916: 112. NEW SYNONYMY.

Diagnosis.—Axillae protruding (Fig. 6); scutellum alutaceous to coriaceous; propodeum laterad of median carina smooth; mandibles reduced (Fig. 10), without obvious teeth; submarginal vein with 7 setae, basal and cubital vein setae present (Fig. 23); midlobe of mesoscutum with 3 pairs of setae (Fig. 6).

This species shares protruding axillae with *cacoeciae*, *loh*, and *louisiana*. However, *cacoeciae* and *loh* have distinctly dentate mandibles and a smooth scutellum. The sunken and sculptured area laterad of the median propodeal carina (Fig. 13), as well as the absence of cubital and basal vein setae under the submarginal (Fig. 22) separate *louisiana* from *cidariae*.

Types.—Ashmead failed to mention how many specimens he had when he described *cidariae*. However, the USNM collection contains 5 specimens labelled as types. Each is mounted on a point with the following data: Cambridge, Mass. Type. Collection Ashmead, no. 2938. USNM type no. 41256. The lectotype (present designation) is mounted on a point with another female and I have indicated it with a black arrow.



Figs. 10–13. Scanning electron micrographs of *Elachertus*. 10, Face and mandibles of *E. cidariae*. 11, Face of male *E. atus*. 12, Dorsal thorax of *E. louisiana*. 13, Propodeum of *E. louisiana*.

Crawford described *hyphantriae* from a series of five females. Four of these specimens have survived and one is missing (the point contains only parts of one leg). The lectotype (present designation) is the only specimen that remains largely intact (Girault mounted and crushed the heads of two of the other syntypes) and I have affixed a lectotype label to it. All of the remaining specimens are labelled as paralectotypes. All of these specimens are point mounted with the following data: Cuero, Texas. Bred from *Hyphantria*. May 10, 1910. USNM type no. 13463.

The two syntypes from which Girault described *marylandicus* are mounted on the same point with no data except a label bearing the species name in Girault's handwriting and the word "type." The lectotype (present designation) is the outermost specimen on the point and is nearly intact. Girault's original description indicated that these specimens were taken in open woodlands in Glendale, Maryland on August 12, 1916.

Variation.—Length varies from 1.3 to 2.0 mm. The thorax and head vary from black to reddish brown. The metasoma varies from entirely yellow to dark brown, often with a lighter area antero-medially. The mandibles and scape vary from yellow to light brown, the funicle from light brown to black. The coxae may be almost entirely yellow, coxae becoming brown to black, the femora dark brown, and tibiae light brown.

Hosts.—Arctiidae: *Hyphantria cunea* (Drury) (fall webworm); *Diacrisia virginea* (F.) (yellow woollybear). Lymantriidae: *Orgyia definita* (Pack.); *O. leucostigma* (J. E. Smith) (whitemarked tussock moth)*; *O. pseudotsugata* (McD.) (Douglas-fir tussock moth). Notodontidae: *Schizura ipomoeae* Doubleday.* Geometridae:

Eulithis diversilineata (Hbn.) (grapevine looper). Coleophoridae: *Coleophora laricella* (Hbn.) (larch casebearer).*

Distribution.—This species has been recorded from most of the states or provinces in eastern United States and Canada and as far west as Texas and Colorado.

Other specimens examined.—76 ♂ and ♀ (CNC); 115 ♂ and ♀ (USNM); 1 ♀ (INHS).

Notes.—In Ryan's key (1979) to the parasites of larch casebearer, he noted an unidentified species of *Elachertus* with protruding axillae. Specimens obtained from Dr. Ryan confirm that the species is *cidariae*.

Elachertus multidentatus (Girault)

Parentedon multidentatus Girault, 1917: 5.

Diagnosis.—Anterior margins of axillae and scutellum forming a straight line (as in Fig. 2); mesoscutum coriaceous; scutellum alutaceous; mandible with row of numerous small denticles along upper edge (Fig. 21); area laterad of propodeal carina sunken and minutely sculptured (similar to Fig. 13); all funicular articles longer than wide.

The relationship of this species to the others remains clouded. Although the axillae are not advanced, the petiole and metasoma are missing from the type and it is not possible to say if *multidentatus* shares these characters with other species like *argissa* and *atus* which have similar axillae. Likewise, the sunken and sculptured area laterad of the propodeal carina of *multidentatus* is similar to *louisiana* Girault, but this last species has blunt mandibles and protruding axillae so that it is doubtful that it is closely related. This is the only species I have seen in which all of the articles of the funicle are longer than broad. In the others, at least the last article is broader than long.

Types.—Lectotype female (present designation) on point with the data: "Jacksonville, Florida, USNM type no. 20759; *Elachertus multidentatus* Girault female type." The head (badly crushed), one forewing, and parts of the legs are slide-mounted. The metasoma and petiole are missing.

Hosts.—Unknown.

Distribution.—Known only from Florida.

Notes.—The only known specimen of this species is the lectotype. As noted above, several critical body parts are missing or have been so badly crushed that definitive statements about the relationship of *multidentatus* to the other species remain problematical.

Elachertus louisiana (Girault)

Epardalus louisiana Girault, 1917: 5.

Diagnosis.—Axillae protruding (Fig. 12); scutellum alutaceous; mandible blunted (as in Fig. 10); propodeum laterad of carina sunken and with foveolate sculpture (Fig. 13); forewing with basal and cubital vein setae absent and submarginal (Fig. 22) with 3 or 4 setae.

This species is most similar to *cidariae*, which shares the protruding axillae, alutaceous scutellum, and blunted mandible. However, *cidariae* has the area laterad of the propodeal carina smooth, and the basal and cubital vein setae are present (Fig. 23) and there are 7 setae on the vein itself.

Types.—Although Girault's original description does not state how many specimens he had, USNM records in Girault's handwriting indicate that there was a series of 3 syntypes. Unfortunately, I have only been able to find a single female in the collection. I hereby designate it as lectotype. The head (badly crushed) and one of the legs is slide mounted. The point mounted thorax bears the data: "La. U. no. 64, sub.1. USNM type no. 20020, *Elachistus louisiana* Gir."

Variation.—No significant variation was observed in the available specimens.

Hosts.—Apaturidae: *Asterocampa clyton* (Bdv. & Leconte).*

Distribution.—Louisiana, Illinois.

Other specimens examined.—2 ♀ and 2 ♂ from Illinois (USNM).

Elachertus loh Schauff, NEW SPECIES

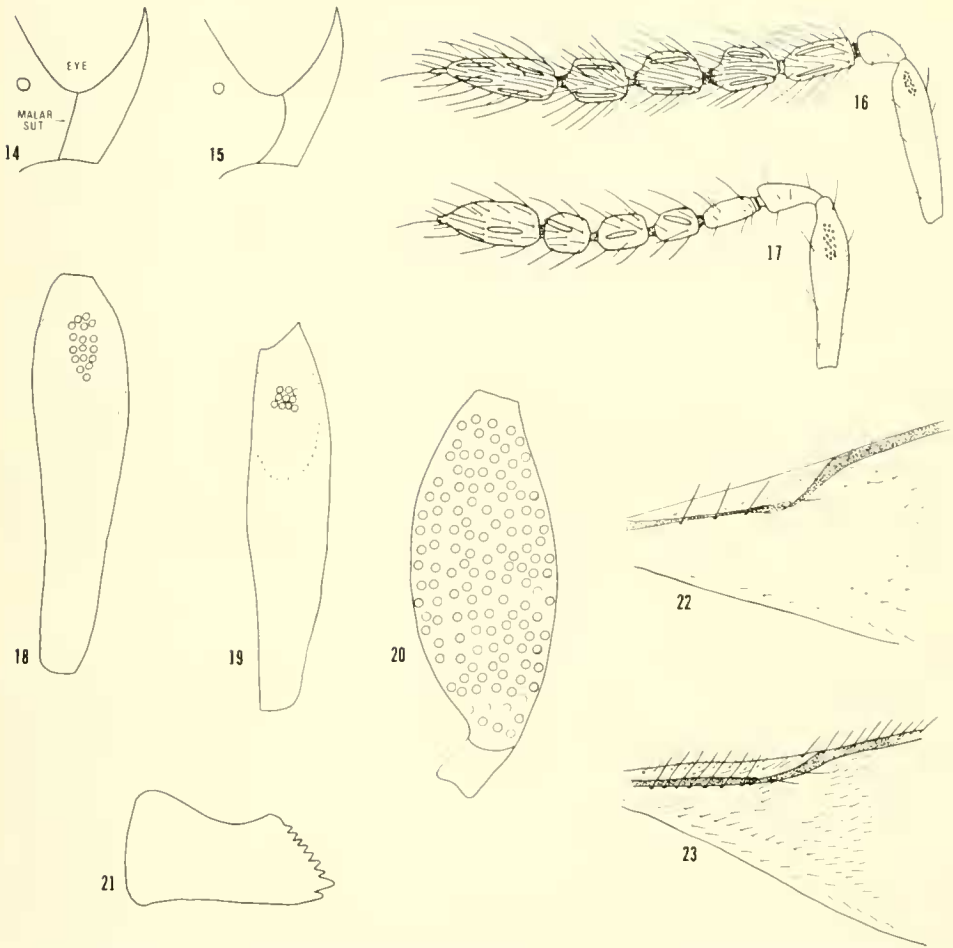
Holotype female.—Length 2.2 mm. Head, thorax, ovipositor sheaths black; dorsal tip of scape, pedicel, funicle, base of forecoxae, metasomal terga except medially on first two brown; scape, mid- and hindcoxae, legs, venter of metasoma and first two terga medially yellow. Head slightly wider than high (66:55); eye height $\frac{2}{3}$ head height, with scattered silvery setae; vertex, frons laterally, genae, occiput lightly alutaceous, with numerous small dark setae; scrobes smooth, face under toruli uniformly rugose (Fig. 9); ocelli slightly raised, POL 2× OOL; malar suture straight; mandibles with 6 teeth; antennal ratio (scape: pedicel: funicle: club) 25:9:11:9:9:8:16, funicular articles gradually widening apically, evenly covered by silver setae about equal in length to width of each antennomere; club with apical digit; thorax with pronotum, middle lobe of mesoscutum, side lobes laterally, and axillae laterally alutaceous; lateral lobes of mesoscutum at notauli, axillae medially, scutellum, metanotum, propodeum laterad of carina smooth, rugose near spiracle; midlobe of mesoscutum with 3 pairs of setae; axillae protruding cephalad of anterior margin of scutellum; dorsellum rounded posteriorly, not excavated above, without lateral lobes; median propodeal carinae complete; petiole reduced to a narrow dorsal band; gaster slightly longer than head and thorax combined, in dorsal view about $\frac{2}{3}$ as wide as long; ovipositor sheaths slightly exerted past tip of gaster; forewing evenly setose beyond submarginal vein; submarginal vein with 6 setae, and basal and cubital vein setae present.

Male.—Similar to the female except for the following: scape with distinct light yellow oval area surrounded by light brown; funicle and femora light yellowish brown; antero-dorsal $\frac{1}{3}$ to $\frac{1}{2}$ of metasoma white medially surrounded by light brown at the edges, ventral $\frac{1}{2}$ white.

Diagnosis.—Axillae protruding (as in Fig. 4); scutellum smooth; face under toruli uniformly rugose (Fig. 9). Males with sensory pores of scape as in Fig. 19.

This species is most similar to *cacoeciae* which also has advanced axillae and a smooth scutellum. The uniform rugose sculpturing under the toruli distinguishes *loh* (face lightly alutaceous only medially in *cacoeciae* Fig. 8). Males can be separated by the pattern of sensory pores on the scape (Fig. 18 for *cacoeciae* versus 19 for *loh*).

Types.—Holotype ♀ on point with data: "Nova Scotia, South Maitland, Hants; 27/VI/1984; P. von Aderkas; ex. leafroller on *Matteuccia struthiopteris*." Deposited in the U.S. National Museum. Paratypes deposited in the USNM: 5 ♀, 4 ♂ same data as above. Paratypes deposited in CNC: 4 ♀, Nova Scotia, Aldershot, July 25, 1949, C. Sawyer. Host sawfly (?) on sensitive fern; 1 ♀, Florida, Liberty



Figs. 14–23. 14–15, Malar sutures. 14, *E. argissa*. 15, *E. atus*. 16–20, Male antennae. 16, *E. argissa*. 17, *E. atus*. 18, Scape of *E. cacoeciae*. 19, Scape of *E. loh*. 20, Scape of *Hyssopus* sp. 21, Mandible of *E. multidentatus*. 22–23, Forewings. 22, *E. louisiana*. 23, *E. cidariae*.

Co., Torreya St. Pk., 7-10-1980, Masner and Bowen. Paratypes deposited in INHS: 18 ♀, 5 ♂, Illinois, White Heath, Aug. 5, 1939, Ross and Riegel.

Variation.—Length varies from 1.6 to 2.3 mm. In males, the coxae vary from yellowish brown to entirely black. In females, the coxae change gradually from yellow through light brown.

Hosts.—A series of specimens from Illinois were reared from the larvae of a pyralid in the subfamily Pyraustinae (Det. by D. Weismann). Both series of specimens from Nova Scotia were reared on ferns. Another series of specimens is labelled as ex. Sawfly (?). In view of the known host associations of the other species, this record is suspect.

Distribution.—United States: Ill., Fla. Canada: Nova Scotia.

Etymology.—This species epithet is formed from the initials of L. O. Howard, who named many of the North American species.

Elachertus atus Schauff, NEW SPECIES

Holotype female.—Length 2.0 mm. Head, thorax, petiole dark metallic greenish black; antennae, mid- and hindcoxae, apical tarsomere of all legs, metasomal dorsum except first tergite brown; forecoxae, femora, tibiae, first 3 tarsomeres, first metasomal tergum, ventral metasoma yellow. Head wider than high (30:26); eye height $\frac{1}{2}$ head height, with scattered silvery setae; vertex, occiput alutaceous; genae strigate; face except scrobes alutaceous, becoming strigate below eyes; scrobes smooth; ocelli slightly raised, POL $1.5 \times$ OOL; malar suture (Fig. 15) curved; mandibles with 6 teeth; antennal ratio (scape : pedicel : funicle : club) 25:9:10:8:8:8:15, funicular articles gradually widening apically, evenly covered by silver setae each slightly shorter than width of each article; apical digit of club short; thorax with pronotum, mesoscutum, dorsellum, propodeum laterally alutaceous; scutellum, axillae coriaceous; propodeum laterad of carina smooth; midlobe of mesoscutum with 10 pairs of setae; axillae ending on straight line with anterior margin of scutellum; dorsellum with lateral lobes, excavated ventrally; median propodeal carina complete; petiole about as long as wide; metasoma as long as thorax and head combined, in dorsal view about $\frac{1}{2}$ as wide as long; ovipositor sheaths slightly exerted past tip; forewing evenly setose past submarginal vein, basal and cubital setae present (as in Fig. 28), submarginal with 8 setae.

Male.—Similar to female except the following: head (Fig. 11) except scrobes rugose, dark brown; eye height less than $\frac{1}{2}$ head height; antennae as in Fig. 17.

Diagnosis.—Anterior margins of axillae and scutellum forming a straight line (as in Fig. 2); petiole about as long as wide; malar suture curved (Fig. 15); POL $1.5 \times$ OOL; scutellum distinctly coriaceous, dorsellum usually with light sculpturing. Males with head dark brown and uniformly rugose except for scrobes (Fig. 11); scape as in Fig. 17.

This species is most closely related to *argissa* which has a straight malar suture (Fig. 14); POL $2 \times$ OOL; scutellum alutaceous (Fig. 2); and the dorsellum usually smooth. Males of *argissa* have the head black or greenish, lightly sculptured, and the eyes at least $\frac{1}{2}$ head height; scape as in Fig. 16.

Types.—Holotype ♀ on point with paratype ♂ with the following data: "Ontario, Niagara; Feb. 18, 1932; W. E. Steenburgh; Crown Gall Goldenrod." Deposited in Canadian National Collection. Paratypes deposited in CNC: 4 ♂ and 6 ♀ with same data as holotype; 4 ♂, 1 ♀ New Brunswick, Kouckibouque N. P., 24-V-1977, G. A. P. Gibson, code 5123A; 1 ♂ Quebec, Great Whale River, 8-VIII-1959, W. R. M. Mason; 1 ♀ Constance Bay, Ontario, V11-1969; 1 ♀ Manitoba, Workworth Cr. near Churchill, 29-VI-1952, J. G. Chilleott; 2 ♀ Ontario, Marmora area, Aug. 25, 1959, L. K. Smith. Paratypes deposited in USNM: 1 ♂, 1 ♀ California, Saticoy, S. E. Flanders collector, ex. *Archips argyrosipilus*; 1 ♂, 1 ♀ Indiana, Porter Co., Washington Twp., L. G. Jones, 8-14-1931, from lepidopterous leafroller on goldenrod; 1 ♀, Dixie Co., Fla., May 23, 1972; 2 ♀, New York, Essex Co., Whiteface Mtn., summit 4800', 30 July, 1979, E. E. Grissell and M. E. Schauff; 1 ♂, Vermont, Rutland Co., 2 mi. E. Danby, 31 July, 1979, E. E. Grissell and M. E. Schauff; 1 ♀, Midland Co. Michigan, 6-24-52, R. R. Dreisbach; 2 ♂ and 2 ♀ same data as holotype.

Variation.—Length varies from 1.2 to 2.0 mm. The coxae vary from light brownish yellow to dark brown, the femora and tibiae from yellow to light brown.

One male specimen has all the legs entirely dark brown to blackish. The dorsellum is generally distinctly alutaceous, but this fades to nearly smooth in a few specimens.

Hosts.—Tortricidae: *Archips argyrospilus* (Wlk.) (fruittree leafroller).*

Distribution.—Eastern and central Canada, Indiana, New York, Vermont, Michigan, Florida, and California. The presence of this species in California indicates that it is probably more widespread than currently known.

Etymology.—The species epithet is an arbitrary combination of letters.

UNPLACED SPECIES

Elachertus spilosomatis (Howard)

Elachistus spilosomatis Howard, 1891: 195.

Howard proposed *spilosomatis* by indication to a figure of the pupae attached to their host (*Diacrisia virginica*). No types or other specimens of this species are known to exist. Since there is no way in which to definitely relate the figure of the pupa to any known species, I am reluctant to synonymize it (particularly since it would most likely be the senior synonym).

ACKNOWLEDGMENTS

I thank the following individuals and their institutions for the loan of material: C. M. Yoshimoto, Biosystematics Research Institute, Ottawa, Ontario, Canada; Wallace LaBerge, Illinois Natural History Survey, Champaign, Illinois; Z. Bouček, Commonwealth Institute of Entomology, British Museum, London; R. Danielsson, Museum of Zoology and Entomology, Lund University, Lund, Sweden; D. C. Darling, Oregon State University, Corvallis, Oregon; R. Ryan, Pac. Northwest Forest and Range Expt. Sta., La Grande, Oregon. I am grateful to the following individuals for reviewing the manuscript and for their many helpful comments: E. E. Grissell, A. S. Menke, R. E. White, and J. LaSalle. A special thanks to Don Weismann for determining a host larva and Linda Heath Lawrence for the habitus drawing.

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